**S1 Text: Methodologies in gonococcal antimicrobial surveillance programmes (GASPs)**

The 2012 WHO Surveillance Standards recommend the use of appropriate sampling methods, laboratory techniques and quality assurance (QA) procedures [1-3]. These standards include the microbiological and epidemiologic requirements to ensure data validity and comparability. Due to the highly variable nature of *Neisseria gonorrhoeae*, these standards and other similar standards need continuous and regular reviewing and, when required, updating.

Different countries vary significantly in their approaches to gonococcal AMR surveillance. Some regions or countries conduct AMR surveillance by testing all *N. gonorrhoeae* isolates (e.g., Australia [4]); through sentinel sites with a pre-defined, representative sample size on a monthly basis (e.g., US GISP [8-9]); or with a pre-defined, representative sample size using isolates collected continuously for several months until the sample size has been reached (e.g., Euro-GASP [10-11,8] and UK GRASP [12]). However, the majority of countries conduct passive and voluntary AMR surveillance based on submitted laboratory data or *ad hoc* surveys every 2–3 years. Very few GASPs, e.g., Euro-GASP and US GISP, collect comprehensive epidemiologic data for the patients and link it to the AMR data [8-11].

In the GASPs, the laboratory testing is either centralized through reference laboratories or decentralized, and conducted at the site of collection. There are a number of laboratory methods used for AMR testing, and they vary in their interpretative criteria. In countries participating in Euro-GASP [10-11],US GISP [8-9], Canada [13] and Australia [4], only quantitative methods for determination of the minimum inhibitory concentration (MIC) of antimicrobials, such as agar dilution method or Etest, are used. However, in some countries or regions, for some antimicrobials, only the agar dilution breakpoint method is used. Qualitative disc diffusion methods, with dichotomous interpretative criteria, have been widely used in the GASPs in the WHO South-East Asian Region [14], the Western Pacific Region [15], and in the few Eastern Mediterranean Region countries that have performed any gonococcal AMR surveillance. It is recommended that, at a minimum, decreased susceptibility or resistance to ESCs identified with disc diffusion methods should be verified with quantitative MIC determination, and the use of quantitative MIC determination methods is being expanded through GASP initiatives.

Most countries use either the interpretative criteria of the European Committee on Antimicrobial Susceptibility Testing (EUCAST; www.eucast.org) or the Clinical Laboratory and Standards Institute (CLSI; www.clsi.org).

To harmonize, standardize and quality assure the laboratory methodologies, and for comparability of GASP data globally, the WHO GASP develop panels of WHO *N. gonorrhoeae* reference strains for quality control (QC) and QA of the AMR data nationally and internationally. WHO *N. gonorrhoeae* reference strains (n=8) were selected and characterized in detail – phenotypically and genetically – in 2008 by the regional coordinating laboratories for the WHO Western Pacific Region and the European Region [1]. In 2016, a new panel of WHO *N. gonorrhoeae* reference strains, with six additional strains and further phenotypic and molecular (including whole-genome sequencing) characterization, was developed [2]. These WHO *N. gonorrhoeae* reference strains enable intra-laboratory and inter-laboratory comparison of test results at adjoining national or regional centres, with variability in laboratory methods [1,2]. These WHO reference strains can also be used for QC in phenotypic and molecular diagnostics, for molecular AMR prediction and molecular epidemiology, and as fully characterized reference genomes in, for example, whole-genome sequencing analysis [2].

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